

CLAIMS

WE CLAIM:

1 1. An optical transistor, comprising:
2 an optical base port for receiving an optical signal (λ_B);
3 an optical emitter port for generating an amplified replica (λ_E) of the input
4 optical signal;
5 an optical collector port for generating an amplified inverted replica (λ_C)
6 of the input optical signal; and
7 a body coupled to the optical base port, the optical emitter port, the optical collector port.

1 2. The optical transistor of Claim 1, wherein the optical collector port
2 comprises an orthogonally polarized or wavelength shifted optical beam, the orthogonally
3 polarized or wavelength shifted optical beam being collinearly propagating with an
4 amplified signal generated from the optical signal (λ_B).

1 3. The optical transistor of Claim 1, wherein the optical collector port is
2 positioned in a plane on a wafer and is orthogonally or obliquely propagating relative to
3 an amplified signal generated from the optical signal (λ_B).

1 4. The optical transistor of Claim 1, wherein the body comprises:
2 a bottom Distributed Bragg Reflector (DBR);
3 an active region overlaying the bottom DBR; and
4 a top (DBR) overlaying the active region.

1 5. The optical transistor of Claim 4, wherein the body comprises:

2 a substrate placed underneath the bottom DBR;
3 a bottom cladding layer overlaying the bottom DBR;
4 a top cladding layer disposed between the bottom DBR and the active
5 region; and
6 a confinement layer disposed between the top cladding layer and the top DBR.

1 6. The optical transistor of Claim 1, wherein the input optical signal
2 propagates horizontally through the active region to generate an amplified replica (λ_E).

3 7. The optical transistor of Claim 6, wherein the input optical signal
4 propagates horizontally through the active region and vertically through the top cladding
5 layer, the confinement layer, and the top DBR, an amplified inverted replica (λ_C).

1 8. A method for an optical transistor, comprising:
2 receiving an input light signal (λ_B) with stimulated emission; and
3 responsive to the input light signal, generating a first amplified replica
4 light output signal (λ_E); and
5 responsive to the input light signal, generating a second inverted amplified
6 replica light output signal (λ_C);
7 wherein the first amplified replica light output signal (λ_E) and the second
8 inverted amplified replica light output signal (λ_C) share a ballast cavity.

1 9. The method of Claim 8, further comprising: injecting the input light signal
2 (λ_B) that is orthogonal to the second inverted amplified replica light output signal (λ_C).

1 10. The method of Claim 8, where the first amplified replica light output
2 signal (λ_E) is linear or gain stabilized by either optical feedback of a laser, an injected
3 optical signal, or pump or electrical modulation.

1 11. The method of Claim 8, where the second inverted amplified replica light
2 output signal (λ_C) is linear or gain stabilized by either optical feedback of a laser, an
3 injected optical signal, or pump or electrical modulation.

1 12. The method of Claim 8, wherein the input light signal (λ_B) comprises
2 generates an unidirectional signal flow, thereby providing isolation between the input
3 light signal (λ_B) and the second inverted amplified replica light output signal (λ_C).

1 13. An optical transistor, comprising:
2 an optical base port for receiving an optical signal (λ_B);
3 an optical emitter port for generating an amplified replica (λ_E) of the input
4 optical signal;
5 an optical collector port for generating an amplified inverted replica (λ_C)
6 of the input optical signal;
7 a body coupled to the optical base port, the optical emitter port, the optical
8 collector port; and
9 a means to obtain unidirectional signal flow from the optical base port to
10 the optical emitter port or the optical collector port.

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